DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Re claim 15, the phrase "adapted to" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. The claims fail to positively recite the necessary steps and limitations as to how optical path length is adapted to be modified by an electrical driver signal. See MPEP § 2106, § 2111.04 [R-3]. Also see *Minton v. Nat 'l Ass 'n of Securities Dealers, Inc.,* 336 F.3d 1373, 1381, 67 USPQ2d 1614, 1620 (Fed. Cir. 2003).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 15 and 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto et al (herein Miyamoto) US Patent 6,559,996 in further view of Rolland et al (herein Rolland) US Patent 5,799,119.

Re claim 15, Miyamoto discloses a transmitter for an optical RZ-DPSK communication signal *(Fig. 1)*, comprising:

a) a source for an optical carrier *51, light source, Fig. 1)*;

b) an electro-optical modulator *(optical intensity modulator 4, Fig. 1)* for intensity modulating the optical carrier based on the driver signal *(modulator 4 is a push-pull type*

Mach-Zehnder intensity modulator which receives differential signal in complementary form to generate modulated RZ optical signal Col 9, lines 37-41. wherein the optical RZ signal could be seen in Fig. 3 to be intensity modulated) ; and

c) a driver circuit *(Driver circuit 3 and 3', Fig 1)*for generating the driver signal from an electrical communication signal *(Driver circuits receive is signals from the output of the pre-coded circuits and the band-pass filter which originate from an electrical NRZ signal, Fig. 1, which is an electrical communication signal)*, the driver signal being an impulse-type signal having impulses of two types *(the number 3 and 3' are an AC-coupled type driver for amplifying differentiated signal to the level enough to operate an optical Mach-Zehnder modulator Col 9, lines 34-37, wherein the differentiated signal is shown in Fig. 3, which has two types of impulses)*spaced in time by a neutral signal state *(the differentiated signal in Fig.3 shows that the pulses are spaced in time by a neutral state)* wherein the impulse of the two types have opposite signs *(Fig. 3 shows that the differential signal having to types have opposite signs. Furthermore, it is discloses that the differentiation pulses having opposite polarities and the same amplitude from each other from ground level, Col 9, lines 30-34)*, and wherein during the neutral signal state of the driver signal, a transmission of the modulator becomes zero *(Fig. 3 also shows the phase inverted optical RZ signal wherein one can see that the during the neutral state of the differential signal, which is the driver signal, the optical transmission becomes zero)*, and the two types of impulses cause the transmission of the modulator to be different from zero and a phase shift which is specific for each type of the impulses *(Fig. 3 also show the phase inverted optical RZ signal, which shows that the two types of impulses cause the optical transmission to be different from zero and the phase of the RZ optical signal shown that the type of impulse results in a specific phase shift depending on the type of impulse)*.

Miyamoto discloses a Mach-Zehnder intensity modulator, but does not appear to explicitly disclose an electro-optical modulator having at least one element with an optical path length adapted to be modified by an electrical driver. However, Rolland discloses that an integrated MZ or Mach-Zehnder modulator comprises an optical waveguide splitter coupled to a first and second waveguide channels or arms which provide electro-optical modulator sections, and a waveguide combiner, wherein the electrodes are associated with each of the waveguides arms and provide a modulated voltage to one or both electrodes to change then index of the light beams, resulting in the relative phases to be altered such that the differential phase change results in both beams combination in phase to give a maximum intensity or on signal and where as a shift of π results in the beam extinction or an "off" signal, Col 1, lines 48-59. Miyamoto and Rolland are analogous art because they are from the same field of endeavor, MZ modulators. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Miyamoto and Rolland before him or her, to understand the MZ modulator of Miyamoto to include an optical path length adapted to be modified by an electrical driver of Rolland because it is a well known configuration of the Mach-Zehnder modulator.

Re Claim 16, Miyamoto and Rolland disclose all the elements of claim 15, which claim 16 is dependent upon. Furthermore, Miyamoto discloses in that the specific phase shifts differ by π *(Fig 3 shows the phase of the RZ optical signal wherein the shifts are either 0 or* π, hence they differ by π*)*.

Re claim 20, Miyamoto and Rolland disclose all the elements of claim 15, which claim 20 is dependent upon. Miyamoto discloses in that the driver circuit comprises a difference circuit for forming a pre-coded signal *(an output of said-recoding circuit is applied to respective bandpass filters 2 and 2', each o which operates as a differentiated circuit for generation differentiation pulses, Col 9, lines 29-34. Wherein the output of the differentiation circuit is coupled tot eh drive*

circuit 3 and 3', Fig. 1. Hence the drive circuit includes the pre-code circuit 1 and 1' and the bandpass filter 2 and 2', which make a differentiated circuit. Furthermore, the differentiated circuit provides differentiation pulses, Col 9, lines 29-32, which is a pre-coded signal), representative of a difference between subsequent bits of the electrical communication signal, and the driver signal is derived from the pre-coded signal *(the pre-coded circuit comprises of a exclusive OR circuit, Fig. 3, that receives the data signal, which is the present data bit, and an input from a one-bit delay circuit, which sends the bit prior to the present data bit. The exclusive OR circuit compares the bit and will output a "high" signal if the two subsequent bits are different and a "low" signal if the two subsequent bits are the same. Therefore the signal being output from the XOR circuit is representative of a difference between subsequent bits of the communication signal)*.

4. Claims 17 - 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto and Rolland as applied to claim 15 above, and further in view of Winzer US PG PUB 2003/0007231 A1 and Singh et al (herein Singh) US Patent 6,185,345.

Re claim 17, Miyamoto and Rolland disclose all the elements of claim 15, which claim 17 is dependent upon. Miyamoto and Rolland disclose in that the modulator *(Miyamoto discloses that the modulator is a Mach-Zehnder, Col 9, lines 38-39)* is an interferometer having arms *(Rolland teaches integrated MZ or Mach-Zehnder modulator comprises an optical waveguide splitter coupled to a first and second waveguide channels or arms which provide electro-optical modulator sections, and a waveguide combiner, wherein the electrodes are associated with each of the waveguides arms and provide a modulated voltage to one or both electrodes to change then index of the light beams)*. Miyamoto and Rolland do not appear to explicitly disclose in which the optical path length of at least one of the arms is controllable by the driver signal, and in which a neutral signal level corresponds to a path length difference between the

arms of half of a carrier wavelength of the optical carrier. However, Winzer discloses an RZ optical signal generator *(Fig. 1)*, that includes a delay-line interferometer *(115, Fig. 1)* such that one of the interferometer arms 116 includes an adjustable delay element 117 which is arranged to control the amount of delay introduced into the optical signal in each interferometer arm with respect to the other *(paragraph [0010])* wherein the delay will determined the duty cycle and the neutral signal of the cycle. Miyamoto and Rolland and Winzer are analogous art because they are from the same field of endeavor, optical modulation. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Miyamoto, Rolland and Winzer before him or her, to modify the interferometer of Ishida and Miyamoto to include the delay element of Winzer because it allow the individual with implement a desired duty cycle in the provided RZ pulses *(paragraph [0010])*, which enables better synchronization.

Winzer does not appear to explicitly disclose that they delay difference is implemented by a difference in path length. However, Singh discloses the implementation of variable delay in a Mach-Zehnder interferometer is implemented by affecting the relative optical path length between the first and second optical waveguides. Winzer, Miyamoto, and Singh are analogous art because they are from the same problem-solving area, implementing a variable delay in a Mach-Zehnder interferometer. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Wizner, Miyamoto and Singh before him or her, to understand the delay element of the Mach-Zehnder interferometer of Winzer and Ishida to as a variation of the relative optical path length between the first and second waveguides in the Mach-Zehnder interferometer *(Col. 11, lines 11-17)*.

Re claim 18, Miyamoto, Rolland, Winzer, and Singh disclose all the elements of claim 17, which claim 18 is dependent upon. Furthermore, Rolland discloses two conductors are used for transmitting the driver signal *(electrodes are associated with each of the waveguides arms*

and provide a modulation voltage to one or both electrodes to change the index, and thereby the relative phases of the two light beams may be altered, Col 1, lines 52-55). Rolland does not explicitly disclose wherein the impulses of a first type are transmitted on a first of the conductors, and wherein the impulses of a second type are transmitted on a second of the conductors. However, Miyamoto discloses that signals 3 and 3' are amplified differentiated signal applied to the MZ intensity modulator, Fig. 1, Col 9, lines 34-37. At the time of the invention, according to the combination of Miyamoto and Rolland, it would have been obvious for one of ordinary skill in art to understand that driving signals 3 and 3' are applied to the electrodes.

Furthermore, Miyamoto discloses that the input to the precoded circuit 1 is Data and the input into precoded 1' is the complementary form of the Data input into precoded circuit 1, Fig. 1. That that the pair of pre-coded circuit and a pair of bandpass filter may be implement by the bipolar code converter providing a pair of complementary outputs, Col 9, lines 45-47. Since the differential output is attained by a pair of complementary outputs, it would be easily understood that the drive signals 3 and 3' and complementary to each other and therefore would contain impulses of different types.

Re claim 19, Miyamoto, Rolland Winzer, and Singh disclose all the elements 18, which claim 19 is dependent upon. Winzer discloses various arrangements for interferometer 115 will be apparent to person skilled in the art, including two separate delay elements, one in each interferometer arm, that each provide one of the coarse and fine delays described above, wherein one may be fixed and the other adjustable or controllable, paragraph [0013]. Winzer does not explicitly disclose that the two arms each comprise of a controllable optical path length. However, at the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Winzer before him or her, to modify the interferometer of Winzer and

Ishida to have both delays or optical path length adjusters controllable because each delay provides either coarse or fine delay, paragraph [0013], and it would allow the user to control the coarse delay independently from the fine delay of the system.

Naturally flowing from the combination, since there is a delay element in each as, as disclosed by Winzer, and a conductor in each arm, as disclosed by Rolland. There is delay in one arm will be connected to the conductor present in said arm because they are both connected to the same optical path.

5. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto and Rolland as applied to claim 20 above, and further in view of Roberts et al (herein Roberts) US Patent 4,975,595.

Re claim 21, Miyamoto and Rolland disclose all the elements of claim 20, which claim 20 is dependent upon. Miyamoto discloses the difference circuit comprises an XOR-gate *(7, Fig. 2)* and a one bit delay circuit, *(8, Fig. 2)*. Miyamoto does not appear to explicitly disclose and a flip-flop along with the XOR-gate. However, Roberts discloses a well known in the art of electronic circuits are D-type flip flop is a binary devoiced used to provide a one-bit delay. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Miyamoto and Roberts before him or her, to modify the pre-coder of Miyamoto to include the D-type flip flop of Roberts as the one-bit delay device because a flip-flop is a well known device that is able of providing a one bit delay in logical circuits *(Col. 1, lines 26-34)*, and due its wide application and common use, it is also cost effective.

6. Claim 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto and Rolland as applied to claim 15 above, and further in view of Winzer US PG PUB 2003/0007231.

Re claim 27, Miyamoto and Rolland disclose all the elements of claim 15, which claim 27 is dependent upon. Miyamoto and Rolland do not appear to explicitly disclose and a control means for varying a ratio between duration of the impulses and duration of the neutral signal state. However, Winzer discloses Winzer discloses an RZ optical signal generator *(Fig. 1)*, that includes a delay-line interferometer *(115, Fig. 1)* such that one of the interferometer arms 116 includes an adjustable delay element 117 which is arranged to control the amount of delay introduced into the optical signal in each interferometer arm with respect to the other *(paragraph [0010])* wherein the delay will determined the duty cycle *(Claim Text 3)*, which is the ratio or fraction of the pulse duration and the duration of the neutral signal. Miyamoto and Winzer are analogous art because they are from the same field of endeavor, optical modulation of RZ pulse. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Miyamoto, Rolland and Winzer before him or her, to modify the modulator of Miyamoto to include the delay element of Winzer because it allow the individual with implement a desired duty cycle in the provided RZ pulses *(paragraph [0010])*, which enables better synchronization.

Re claim 28, Miyamoto, Rolland, and Winzer disclose all the elements of claim 27, which claim 28 is dependent upon. Miyamoto, Rolland, and Winzer do not explicitly disclose that a mono-flop is located in the clock link of the driver circuit. However, Miyamoto discloses that according to another embodiment of the present invention discloses the electrical-optical conversion comprise a clock electrical signal generation means for providing clock electrical with which said NRZ signal is synchronized and that the clock pulse optical source receiving said cock electrical signal and providing optical clock pulse synchronized with said clock electrical signal Col 5, lines 16-24. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Miyamoto before him or her, to modify the

optical transmitter of Miyamoto to include the clocks signal of another embodiment of Miyamoto because it synchronizes the clock laser along with the clocked driving signal, therefore synchronizing the whole system. Furthermore, it would have been obvious to one of ordinary skill in the art as a matter of design choice to include a mono-flop in the clock line.

Allowable Subject Matter

7. Claims 22- 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TANYA NGO whose telephone number is (571) 270-7488. The examiner can normally be reached on M - F from 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngo/
October 28, 2010

/Kenneth N Vanderpuye/

Supervisory Patent Examiner, Art Unit 2613